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WORK PLAN FOR THE SOUTH GROUNDWATER CONTAMINATION PLUME REMOVAL ACTION PART 5 GROUNDWATER MODELING AND GEOCHEMICAL INVESTIGATION AUGUST 1992

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WORK PLAN FOR THE SOUTH GROUNDWATER CONTAMINATION PLUME REMOVAL ACTION

PART 5

GROUNDWATER MODELING AND GEOCHEMICAL INVESTIGATION

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

U.S. Department of Energy
Fernald Field Office

Revision 1

August 1992

1.0 BACKGROUND

The fundamental objective of the South Groundwater Contamination Plume (South Plume) Removal Action as presented in the Engineering Evaluation and Cost Analysis (EE/CA) South Plume Report is to protect public health by limiting access to and use of groundwater with uranium concentrations exceeding the derived concentration limit of 30 μg/L for uranium in drinking water. Protecting the groundwater environment of the sole source aquifer and controlling the uranium plume to prevent migration to additional receptors to the south are secondary objectives of the removal action.

To accomplish these objectives, the removal action has been divided into five parts:

- Part 1 — Alternate Water Supply;
- Part 2 — Pump and Discharge System;
- Part 3 — Interim Advanced Wastewater Treatment Facility System;
- Part 4 — Groundwater Monitoring and Institutional Controls; and
- Part 5 — Groundwater Modeling and Geochemical Investigation.

During several discussions among WEMCO, ASI/IT, DOE, and Paddys Run Road Site (PRRS) staffs as well as with U.S. EPA and Ohio EPA — and through the analysis of existing data — the following actions were proposed for Part 5:

- determining the location of the leading edge of the 20 μg/L uranium-contaminated groundwater plume (20 μg/L is the proposed maximum contaminant level [MCL] issued since the EE/CA was approved);
- evaluating the location of plumes associated with PRRS and the impact on these plumes by pumping the FEMP Part 2 recovery well field; and
- performing the required field sampling, data analysis, and computer modeling of flow and particle tracking to enable setting the location and design of the Part 2 recovery well field.

The FEMP has organized these actions into this work plan, which has been rewritten due to the many changes occurring in the South Plume area. This work plan presents a summary of the current data and the steps required to complete the actions. The work plan presents introductory information on the South Groundwater Contamination Plume Removal Action and the evolution of Part 5, and includes a brief discussion of the groundwater modeling effort. The plan also describes field activities, including sampling of existing and new monitoring wells and piezometers and the use of the Hydropunch II groundwater sampling technique, and the reasons why a soil vapor survey may be necessary. The work plan concludes by providing a schedule for completing the field activities.

2.0 INTRODUCTION

The original conceptual design for Part 2 of the removal action was to install three to five recovery wells in the vicinity of New Haven Road to intercept the uranium plume. The recovery wells were to be screened over the top 40 feet of the aquifer and provide a combined pumping rate of 1500 to 2500 gallons per minute (gpm). This well field was designed to intercept the plume while not reversing the aquifer flow south of the well field.

In the draft EE/CA which was issued for U.S. EPA, Ohio EPA, and public comment, the uranium-contaminated groundwater intercepted by the Part 2 recovery well field was to be pumped back to the FEMP, monitored, and then discharged directly to the Great Miami River through the FEMP outfall line without being treated. However, in the approved final EE/CA, DOE, U.S. EPA, and Ohio EPA agreed that the FEMP can discharge the South Plume groundwater without treatment, but the site must remove a greater than equivalent mass of uranium from its other wastewater streams. The result is that the net amount of uranium being discharged to the river will not increase above the 1,862 pounds per year discharged in 1989. Indeed, per agreement, the total amount of uranium in the FEMP wastewater discharged to the river will not exceed 1,700 pounds per year. Because the South Plume groundwater will not be treated, it must be of relatively good quality (except for the elevated uranium concentration).

After the EE/CA had been approved, additional data from the FEMP RI/FS groundwater monitoring and the PRRS RI/FS became available which indicated that elevated levels of inorganic and organic chemicals were present in the groundwater where the Part 2 extraction well field was to be installed. In the FEMP's meeting with the U.S. EPA and Ohio EPA on May 22, 1991, the participants determined that the well field could not successfully be located in the area immediately north of New Haven Road. All parties agreed that the recovery wells should be located north of the Albright and Wilson, Americas (AWA) facility where the inorganic and organic plumes are not of concern.

FEMP presented the results of the initial modeling with the recovery well field located at the northern edge of the AWA facility to the U.S. EPA and Ohio EPA at a July 23, 1991 meeting. Participants discussed the need for additional monitoring wells to verify the computer-predicted uranium concentrations in the groundwater which will be pumped by the recovery well field. As mentioned previously, this amount of uranium must be offset by removing a greater than equivalent mass of uranium from other FEMP wastewater streams. The methodology for achieving the greater than equivalent uranium mass removal is addressed in the Parts 2 and 3 Work Plan.

3.0 SUMMARY OF CONTAMINATION

This section provides a brief summary on the overall radiological and nonradiological contamination at the FEMP facility and surroundings.

3.1 Summary of Radiological Contamination

At the time the initial Part 5 Work Plan was issued, FEMP had completed only one sampling round over a relatively short period of time for a large number of wells and piezometers within the South Plume area. The data from this round (April/May 1990) indicated a wide area where total uranium concentrations were between 10 and 30 $\mu g/L$, as shown in Figure 1.

Figure 1 also shows that the glacial overburden is not present in much of the South Plume area. In those areas, the surface material is alluvium from a time when the Great Miami River meandered over this area. Under the alluvium is the sand and gravel of the Great Miami Aquifer. The wells in the South Plume area installed for the FEMP RI/FS and piezometers and wells installed for the PRRS RI/FS are illustrated in Figure 1, and the total uranium concentrations from samples collected during the April/May 1990 sampling round for both RI/FS programs are shown as well. Work has continued to further investigate the uranium plume. Quarterly monitoring and uranium contour maps are produced. This quarterly monitoring effort will continue to further define plume boundaries and seasonal variations.

3.2 Summary of Nonradiological Contamination

Average concentrations of nonradiological data from both the PRRS RI/FS and the FEMP RI/FS are presented in Table 1 (inorganic parameters) and Table 2 (organic parameters) of this work plan. The PRRS data for samples collected in May and July 1990 indicate that there is a significant inorganic plume from the area of the AWA facility and an organic plume in the area of the Ruetgers-Nease facility. Information compiled in a draft FEMP Groundwater Report indicates that there is an apparent groundwater quality signature of inorganic chemicals (barium, iron, magnesium, potassium, sodium, chlorine, and total phosphorus) in the plume from the PRRS site.

As shown in Table 1, FEMP RI/FS Well 2094 — located downgradient of the PRRS site — has concentrations of inorganic parameters above the average values for all the FEMP RI/FS 2000-series wells. The PRRS wells listed in Table 1 (Wells 2626, 2636, and 3636) are located on the east side of the AWA property. All of the signature parameters are found in Wells 2626 and 2636 in concentrations above the average of the FEMP RI/FS 2000-series wells and most of those in Well 2094. Well 3636 shows high levels of iron and barium.

The average specific conductance for samples from Well 2094 is 1341 μmohs/cm, while the overall average is 576 μmohs/cm. Data on specific conductance from the PRRS samples are not available; however, it is clear from the concentrations in Table 1 that specific conductance would be a useful field-screening tool for determining if groundwater is influenced by the PRRS inorganic plume.

Wells in and downgradient from the Ruetgers-Nease plant area contain volatile organic compounds in significant levels. The total number of parameters and the specific concentration of these parameters vary somewhat. Wells 2629 through 2633 are enclosed in boxes in Figure 2 because they contain

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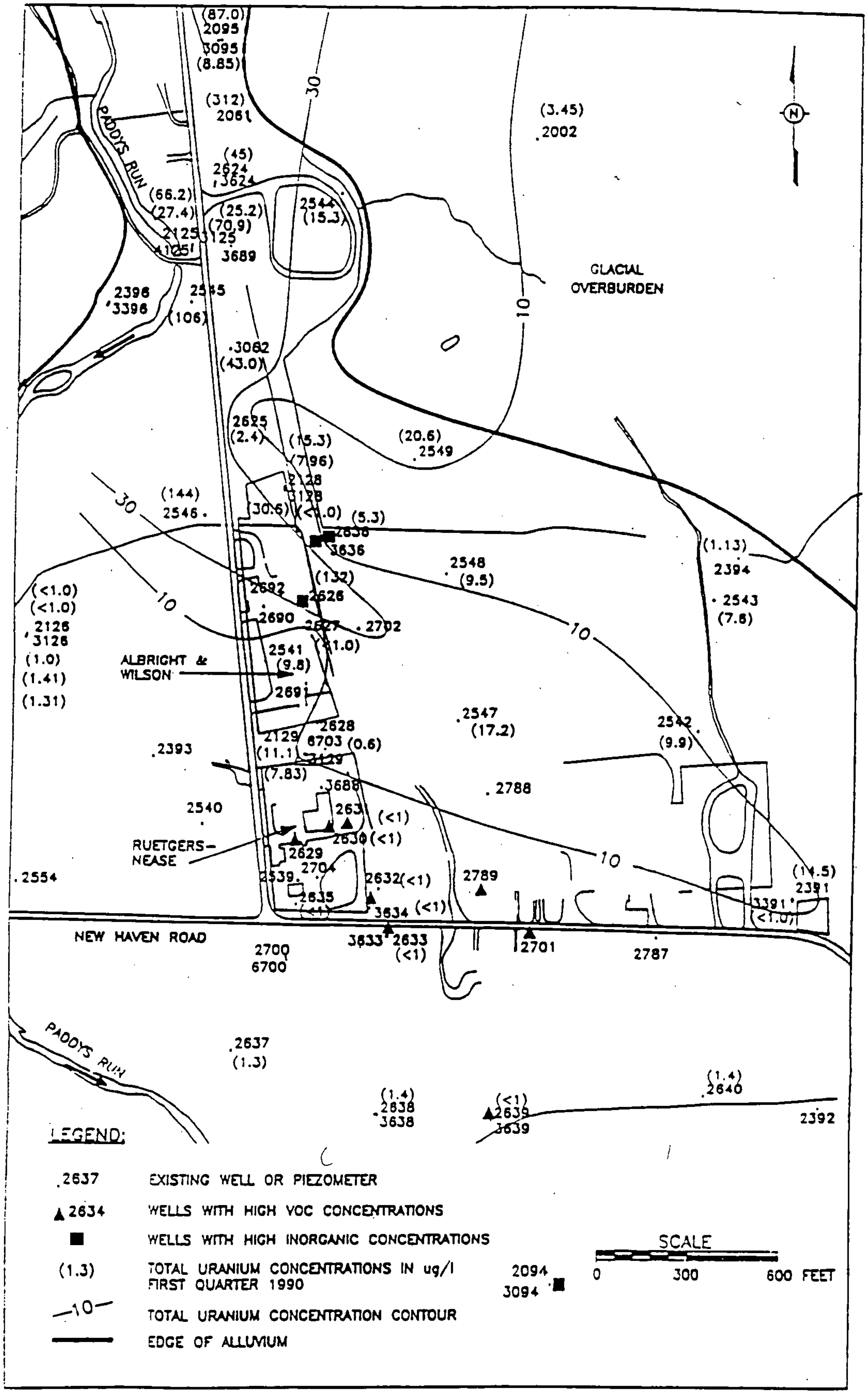

FIGURE 1. SOUTH PLUME AREA DATA APRIL–MAY, 1990

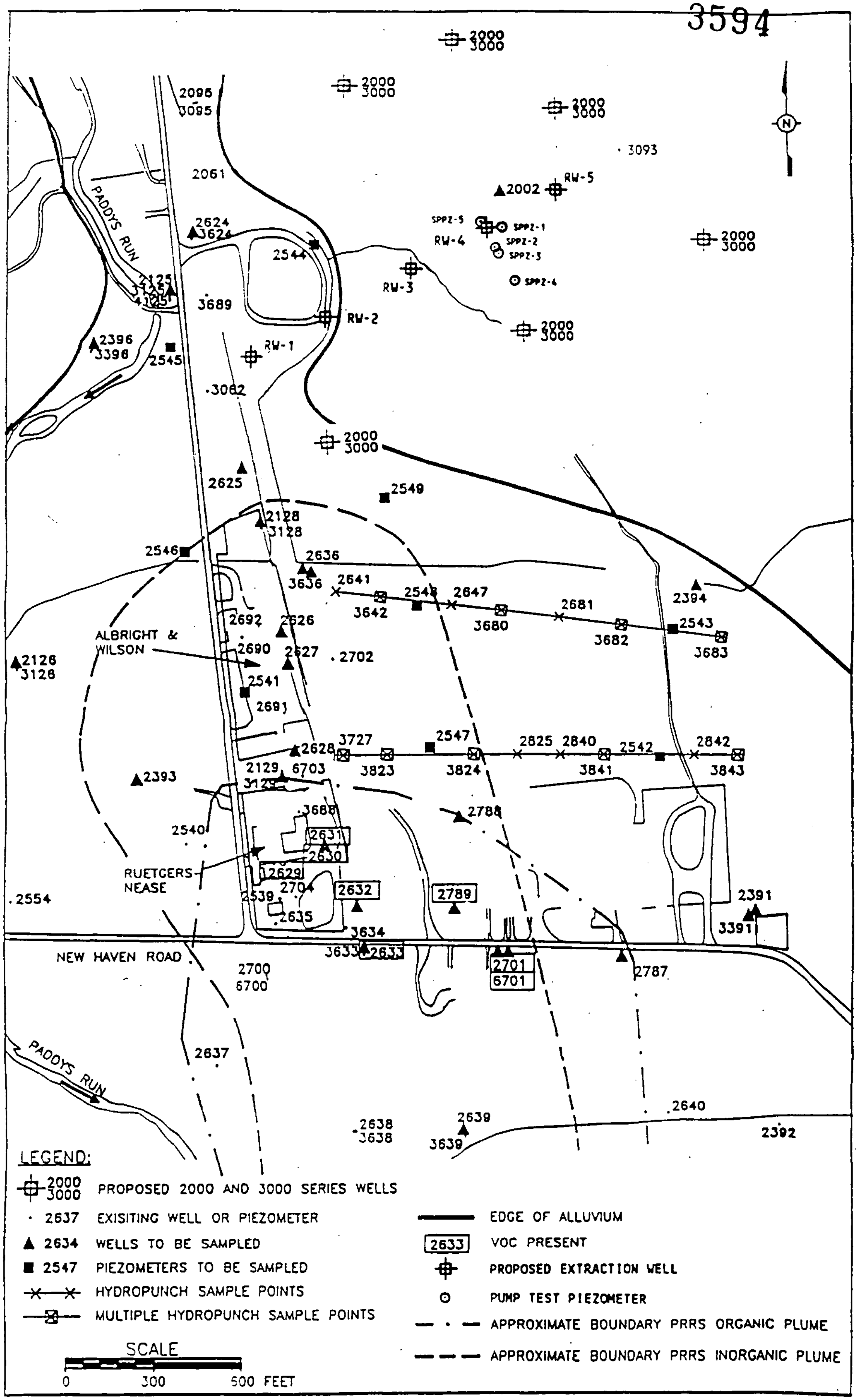

FIGURE 2. PROPOSED SAMPLING LOCATIONS

average levels of ethylbenzene, toluene, total xylenes, and isopropylbenzene greater than 1000 µg/L (Table 2). For Well 2634, each of the signature parameters shown in Table 2, with the exception of toluene, exceeded concentrations of 1000 µg/L.

The PRRS RI/FS installed additional wells after completing two sample rounds. While sampling Well 2701 in February 1991, volatile vapors reached levels that required the sampling team to wear respirators. When Well 2789 was installed in April 1991, field measurements indicated the presence of organic chemicals. Data from these samples clearly indicate that a volatile organic plume exists to the east of the Ruetgers-Nease property. The presence of organic contaminants in Wells 2701 and 2789 prevented FEMP from installing the recovery wells at the original location near New Haven Road, and necessitated the action to move them to the north.

In a rudimentary way, the data provided three separate chemical signatures for the plumes:

- the FEMP plume contains elevated uranium concentrations, with otherwise normal water chemistry;
- the AWA plume contains elevated concentrations of inorganic parameters (some wells also contain elevated uranium); and
- the Ruetgers-Nease plume is characterized by four prominent volatile organic parameters.

Since the original Part 5 Work Plan was issued, the PRRS has continued to investigate their contamination plumes. Figure 2 shows the estimated approximate boundary of the PRRS inorganic and organic plumes as presented at their March 31, 1992, public meeting.

4.0 OBJECTIVES OF THE INVESTIGATION

This section defines the main objectives of the Part 5 investigation activities.
The main objectives are to:

- further define the lateral extent of uranium contamination >20 µg/L;
- further define the vertical extent of uranium contamination >20 µg/L;
- further investigate grain size and textural variation within the sand and gravel aquifer;
- designate recovery well locations and screen lengths;
- designate a range of pumping rates for each recovery well;
- propose locations for monitoring wells to provide data on the effectiveness of the pumping program;
- develop specifications for a water-quality sampling program to monitor removal action progress; and
- select a specific location for the Part 2 recovery well field which will have insignificant impact on the PRRS plumes.

5.0 CONCLUSIONS OF THE INVESTIGATIONS

The investigation goals will be accomplished through computer modeling and field work as described in the following sections.

5.1 Computer Modeling

At the time this revised Part 5 Work Plan was issued, the Swift III Groundwater Model had been used to optimize the location and design of the recovery well field (Figure 2). The model was used to select a well field location which would have minimal impact on particle paths originating in the source areas of the organic and inorganic contamination. The information obtained from the modeling effort has been summarized and issued in a report titled *South Plume Removal Action Groundwater Modeling Report*. The report designates the screen lengths for the extraction wells and designates a range of pumping rates for each well. A second report entitled *South Groundwater Contamination Plume Design Monitoring Evaluation Program Plan* has also been issued which describes the selected locations for monitoring wells and piezometers and provides data on the effectiveness of the Part 2 pumping program. The report also specifies a water-quality sampling program to monitor removal action progress.

5.2 Field Work

This sub-section defines the field activities which will be conducted to take advantage of the distinct character of the three plumes and the relatively simple geologic environment.

The field investigation will consist of the following activities:

- sampling and analysis of existing — as well as proposed — monitoring wells and piezometers to better define the boundaries between the South Plume and the two PRRS plumes;
- hydropunching to screen for the extent of uranium, inorganic, and organic contamination both laterally and vertically in areas not covered by monitoring wells;
- hydropunching in conjunction with the installation of new monitoring wells to screen for the vertical extent of uranium contamination and assist in verifying the adequacy of the depth of the extraction wells;
- continuous coring and gamma logging to evaluate the homogeneity of the aquifer in the South Plume area; and
- a soil vapor survey to help further refine the extent of the organic plume.

The details of the activities (i.e. construction details, laboratory where analysis will be performed, development sampling, etc.) are explained below.

5.2.1 Sampling of Existing Monitoring Wells and Piezometers

Standard groundwater procedures outlined in the RI/FS QAPP will be used to sample the existing monitoring wells and piezometers listed in Table 3 and shown in Figure 2. One sample will be collected from each sampling point and analyzed for total uranium in the WEMCO Laboratory. Every tenth sample will be duplicated and the duplicate will be sent to the IT Laboratory for confirmatory analysis.

The specific conductance of each sample will be measured in the field. Samples with a specific conductance greater the 750 umohs/cm will be analyzed for the HSL metals at the IT Oak Ridge Laboratory. An HNu will be used to screen all samples. If there is a sustained reading of >5 ppm for at least 10 seconds, a VOC sample will be collected and analyzed for HSL volatile compounds at the IT Laboratory.

5.2.2 Hydropunch II Groundwater Sampling

A Hydropunch II tool with a hollow stem auger will be used to collect water samples at predetermined depths to provide for vertical uranium concentration profile determinations. It will be used in conjunction with new monitoring wells and piezometers (see Section 5.2.3) and where permanent wells do not exist. The Hydropunch II tool is designed to be driven into an aquifer to a predetermined depth and then opened to collect a groundwater sample. The tool is made of hardened steel and stainless steel so that all parts that come in contact with the sample are compatible with sampling equipment construction materials specifications found in the RI/FS QAPP.

In operation, an auger is advanced to a depth a few feet above where a water sample is to be taken. The Hydropunch II, equipped with a hardened steel drive point attached to a hollow EW drill rod, is hydraulically pushed or driven into the aquifer ahead of the auger with a standard 140-pound hammer. When the Hydropunch II is at the pre-determined depth, it is back hammered three feet. Soil friction holds the drive point in position while a screen telescopes from the body of the tool. The drive casing has about the same inside diameter as the Hydropunch II. This permits a small diameter bailer to be lowered through the casing and the body of the Hydropunch II for sample collection. Since no material is introduced into the sample zone, the screen does not need to be purged prior to sample collection. This sampling configuration permits an unlimited quantity of sample to be collected. In order to ensure that the drive casing does not leak, a new drive casing will be used for this project and each joint will be sealed by O-rings and teflon plumbers tape.

The Hydropunch II technique offers two distinct advantages over conventional well installations used at the FEMP. First, since there is only an auger hole which is immediately filled and sealed, there is not the expense of installing and developing a well in order to collect a sample. Secondly, the Hydropunch II can be used to collect successively deeper samples, thus allowing the vertical profile of the South Plume to be determined with a much greater degree of precision than with 2000- and 3000-series wells, where screens may be 50 to 80 feet apart vertically. The Hydropunch II will be used according to procedures outlined in the RI/FS QAPP, Document Change Request 68A.

All samples will be measured in the field for specific conductance and then sent to the WEMCO Laboratory for total uranium analysis. One sample in 10 collected with the hydropunch will be split and sent to the IT Laboratory for total uranium analysis. Sampling for organics and inorganics will be dependent on the location of the hydropunch borings as described in Section 6. All samples are to be collected, documented, preserved, shipped and analyzed by methods outlined in the RI/FS QAPP, March 1988, and associated addenda.

Upon completion of drilling and sampling, the portion of the boring below the water table will be allowed to collapse as the augers are withdrawn. Voiclay grout will be used to backfill the boring from the water table to a point three feet below the ground surface. The upper three feet of the boring will be backfilled with the native soil collected from the first five feet of drilling at that boring location.

5.2.3 New Monitoring Wells and Piezometers

Two traverse lines of monitoring wells, one north and one south of the proposed recovery well field and each containing three new well pairs, are being installed to monitor the operation of the well field. The locations of these six monitoring well pairs (each consists of a 2000- and 3000-series well), shown on Figure 2, are explained in the Design Monitoring Evaluation Program Plan (DMEPP), Revision 0, dated July 15, 1992.

Each of the 12 new monitoring wells will be sampled for full radiological parameters, VOC, and general groundwater parameters at two different times: first, when the well is developed and second, about two months later. This installation and sampling will be done using the procedures in the RI/FS QAPP. The analyses will be done at the IT Oak Ridge Laboratory.

In each location, the Hydropunch II sampler will be used during the drilling of these wells to collect samples at various depths below the water table to determine vertical distribution of the uranium within the aquifer. In addition, a seven piezometer cluster is being installed near extraction well RW-4. Sampling of the cluster will provide additional uranium vertical distribution information at that location.

5.2.4 Continuous Core Sampling and Gamma Logging

Continuous core sampling will be performed at each new monitoring well screen location. In addition, the piezometer boring in the seven unit cluster SPPZ-2 which extends to bedrock will be continuously cored over its full length. A gamma ray log will be run in each completed borehole for the purpose of making stratigraphic correlations and calculating permeabilities. The completed log should contain the initial calibration run, the actual run, and the post calibration run. A site geologist will be present when the logs are run. The information obtained will be used to help evaluate the stratigraphy of the South Plume area.

5.2.5 Soil Vapor Survey

Although the FEMP RI/FS is not required to define the extent of the organic plume associated with the PRRS site (or any site in the area), it is important for the success of the removal action that the FEMP know the northern and eastern extent of the organic plume. The information recently obtained at the PRRS public meeting provides the needed information to proceed with the proposed pumping of the Part 2 recovery wells. Data obtained from the hydropunching will help refine the data interpretations.

In the event that data indicate that uranium concentrations >20 ppb exist south of the recovery well field capture zone, the FEMP may need to further evaluate the extent of the PRRS plumes. The geologic environment where the PRRS plumes are located appears to be favorable for using a soil vapor survey to further delineate organic contamination with a relatively high degree of certainty at very low cost. The clay-rich glacial overburden found at the FEMP site does not exist over much of the sand and gravel aquifer in this area of the South Plume. Volatile organic materials are all lighter than water and should migrate to the top of the water table. Relatively permeable alluvial deposits from the Great Miami River rest on the sand and gravel aquifer in this area. Vapors should tend to migrate upward through these sediments. The main factor that would limit the effectiveness of this type of survey would be a high moisture content of the soils. Generally, the higher the soil moisture, the lower the permeability with respect to organic vapors.

A semiquantitative soil vapor survey can be conducted with simple hand-held tools transported on a small four-wheel all-terrain vehicle which will result in minimum impact on private property. The survey would consist of driving a three-eighths-inch-diameter hollow rod to a depth of 60 inches with a slam bar hammer. The tube would be connected to the hollow rod and attached to a Foxboro 126 Organic Vapor Analyzer (OVA) calibrated to a methane standard. Soil vapor would be drawn through the OVA and a reading made in methane equivalents. This analytical device would provide a semiquantitative measure of the extent of the volatile organic plume.

If a soil vapor survey is conducted, soil vapor readings would most likely be taken at 100-foot centers within the study area. If readings drop off dramatically between any two 100-foot stations, an additional reading half way between the two stations would be taken to refine the boundary of the plume. Data from the soil vapor survey would be plotted on maps to determine the extent of the volatile organic plume.

If a survey is conducted, the soil vapor survey technique will be tested by using the equipment to measure vapor levels in the soil at two locations near Well 2701, which reportedly has high levels of volatile contaminants. If the soil vapor technique does not detect vapors at these locations, the survey will be abandoned and a drilling and sampling program will have to be developed. If the vapor analysis detects organic vapors, this will provide a qualitative test that the technique will work in this environment.

6.0 PHASING OF FIELD WORK

This section outlines how the activities in Section 5.2 will be accomplished.
The field activities will be conducted in four phases:

- Phase 1: Two traverse lines of hydropunch borings within the alluvium area and concurrent sampling of existing nearby wells;

- Phase 2: Two traverse lines of monitoring wells with corresponding hydropunch samplings north and south of the proposed recovery well field;
- Phase 3: Seven piezometers clustered near proposed extraction well RW-4; and
- Phase 4: Soil vapor sampling.

Each of these phases, the party responsible for their implementation, and the specific sampling requirements is discussed in the following text.

3.1 Phase 1: Two Traverse Lines of Hydropunch Borings within the Alluvium Area and Concurrent Sampling of Existing Nearby Wells

Figure 2 shows the locations of two traverse lines where the Hydropunch II will be used to collect water samples within the alluvium area, south (downgradient) of the proposed recovery well field on approximately 150-foot intervals. The work will be performed by ASI/IT. The northern line of Hydropunch II borings is anticipated to intercept the PRRS inorganic plume. The southern line of Hydropunch II borings is anticipated to also intercept the PRRS inorganic plume and could possibly intercept the PRRS organic plume based on the data presented at the March 31, 1992, PRRS public meeting.

As shown in Figure 2, there are several points along the two hydropunch traverses where three samples will be collected over a vertical profile. The first Hydropunch II sample at all locations will be collected at a depth of seven feet below the water table. The second sample will be taken at a depth of 20 feet below the water table, and the third sample will be taken at a depth of 30 feet below the water table. In each case, the water table will be determined by measurement in the nearest well or piezometer.

Because the nature and extent of the PRRS plume can be approximated with the available public data, PRRS-contaminant sampling will be focused to avoid unnecessary analyses. Hydropunch II samples from the northern line of hydropunching (i.e., Borings 2641, 3642, 2647, 3680, 2681, 3682 and 3683) will be analyzed for PRRS suspect inorganic parameters with a contingency for volatile organic compound (VOC) analyses. If the groundwater yields an HNu reading > 5 ppm for 10 seconds, the sample will be analyzed for VOCs. Hydropunch II samples from the southern line of hydropunching (i.e., borings 3727, 3823, 3824, 2825, 2840, 3841, 2842 and 3843) will be analyzed for PRRS suspect inorganic parameters and PRRS suspect VOCs.

In conjunction with the two rows of hydropunching, sampling of the existing wells and piezometers listed in Table 3 will be collected by the WEMCO Environmental Monitoring Staff.

6.2 Phase 2: Two Traverse Lines of Monitor Wells with Corresponding Hydropunch Sampling North and South of Proposed Recovery Well

Figure 2 shows the location of the two traverse lines where 12 new 2000- and 3000-series monitoring wells will be installed. One line will be installed north (upgradient) and the other south (downgradient) of the proposed well field. Continuous core sampling will be obtained along the screen length of each of the wells and a gamma log will also be made of each well boring. This information will be used to evaluate the homogeneity of the aquifer in this area. In addition to the well pairs, groundwater samples will be collected at each well pair with a Hydropunch II sampler. The south row will be sampled at depths of 7, 20, and 30 feet below the water table. The north row will be sampled at depths of 20, 45, 65, and 85 feet below the water table. The new monitoring wells and associated hydropunching will be performed by ASI/IT.

The hydropunch data — along with the data obtained from Phase-3 discussed in the next section and the data from the proposed pump test being planned at recovery well RW-4 (discussed in Appendix A of the DMEPP) — will be used to verify the screen interval for the Part 2 recovery wells. Groundwater modeling has predicted that uranium concentrations in groundwater are greatest in the area immediately north of the recovery wells. The information obtained from these new wells and associated hydropunching will be used in conjunction with the Phase 3 piezometers to provide the baseline data for determining the actual concentration of uranium in the groundwater that the wells will be pumping. This data will serve as an alternative to installation of the proposed permanent monitoring wells originally planned for the Delta Steel property. These data will satisfy the evaluation of the IAWWT design requirements operating parameters. The south row of hydropunching data will be used in conjunction with the two rows of hydropunching installed in the alluvium area to define the leading edge of the 20 μg/L uranium isoconcentration.

6.3 Phase 3: Seven-Piezometer Cluster located near Proposed Recovery Well RW-4)

A seven-piezometer cluster (SPPZ-2) will be installed near proposed recovery well RW-4 by a contractor to be determined by the bid and award process. The wells will be installed as part of the part 2D Pump Test Construction package. The piezometer will be used to determine the vertical extent of the uranium contamination within the aquifer and to test the proposed well field's vertical pumping influence as proposed in the DMEPP.

Piezometer cluster locations and depths in relation to Recovery Well RW-4 are as follows (note water table is at an approximate depth of 65-70 feet):

- SPPZ-2A, 25 feet southeast and approximate depth of 110 feet;
- SPPZ-2B, 25 feet southeast and approximate depth of 120 feet;
- SPPZ-2C, 25 feet southeast and approximate depth of 130 feet;
- SPPZ-2D, 25 feet southeast and approximate depth of 140 feet;

- SPPZ-2E, 25 feet southeast and approximate depth of 150 feet;
- SPPZ-2F, 25 feet southeast and approximate depth of [illegible] feet; and
- SPPZ-2G, 25 feet southeast and approximate depth of 230 feet.

In addition, continuous core sampling will be obtained from the deepest piezometer (SPPZ-2G) from 5 feet above the water table to the bottom of the boring which is positioned just above the bedrock shale. A gamma log will also be made of each piezometer boring. This information will be used to evaluate the homogeneity of the aquifer in this area and to aid in stratigraphic correlations.

3.4 Phase 4: Soil Vapor Sampling

A need and location for a soil vapor survey will be determined after the 20 ppb isopleth is located and the Phase 1, 2 and 3 data and proposed pump testing under the DMEPP are evaluated. If needed, a contractor will be selected at that time for the performance of this work.

3.5 Scheduling the Field Investigation

Implementation of the field work for the four phases will depend on securing landowner permission. At the time Revision 1 of this work plan was issued, permission had been obtained for Phase 1 properties and a portion of Phase 2 properties. Drilling and sampling on Phase 1 began on July 29, 1992. Phase 2 field work is projected to be completed by September 30, 1992. Phase 3 field work is projected to begin on September 1, 1992 depending on acquisition of access to remaining properties. Phase 4 is not scheduled at this time.

TABLE 1

Inorganic PRRS Plume Signature
Average Concentrations in mg/L

	Parameter						
Well	Barium	Iron	Magnesium	Potassium	Sodium	Chlorine	Total Phosphorus
FEMP 2094	1.133	17.948	49.23	199.83	69.53	144.75	2.57
2000-series average	0.128	1.749	25.85	13.07	14.22	31.55	0.60
PRRS 2626	2.400	40.250	33.65	420.00	662.50	38.50	257.00
2636	2.200	117.500	52.15	266.50	313.00	570.00	22.36
3636	88.000	1835.000	24.90	4.20	16.20	26.00	1.35

TABLE 2

Organic PRRS Plume Signature
Average Concentrations in $\mu g/L$

Well						
Parameter	2629	2630	2631	2632	2633	2634
Ethylbenzene	8,550	123,000	17,000	21,000	3,850	1,150
Toluene	19,950	215,000	110,000	63,000	1,440	3
Xylenes (Total)	24,900	413,000	31,900	50,850	19,000	4,450
Isopropylbenzene	9,900	133,100	8,500	12,350	6,250	6,000

TABLE 3
Wells and Piezometers to be Sampled by WEMCO Environmental Monitoring

Wells	Piezometers
2002	2541
2125	2542
2126	2543
2128	2544
2129	2545
2391	2546
2393	2547
2394	2548
2396	2549
2624	
2625	
2626	
2627	
2628	
2631	
2632	
2633	
2636	
2701	
6701	
2787	
2788	
2789	
3391	
3636	
3689	

3.7 SOIL VAPOR SAMPLING PROCEDURES

The soil vapor sampling technique will be conducted by driving a six-foot-long, three-eights-inch-diameter solid steel rod into the soil to a depth of approximately five feet. The solid rod is withdrawn and replaced with a 1/4-inch-diameter stainless steel tube inserted to a depth of six inches above the bottom of the hole. A stainless steel cable is placed within the stainless steel tube prior to installation of the tube into the borehole to prevent soil from entering the sample tube. The surface soil is tamped around the tube and the steel cable is then removed. A soil vapor sample is collected through a teflon tube connected in series with the probe of a portable organic vapor detector (e.g., Photovac TIP). A peak reading and a maximum stabilized reading are then obtained from the organic vapor detector and recorded on the Soil Vapor Survey Data Log (Figure 1). Soil Vapor Survey Data logs will be completed by the field technician and turned in daily for data analysis.

The stainless steel tubes will be decontaminated prior to use by high pressure steam cleaning followed by flushing the tubes with bottled air or nitrogen to eliminate the possibility of cross-contamination between samples. An adequate supply of tubes will be maintained to complete each day's measurements without reusing a tube.

The solid rod used to make the test hold will be decontaminated following each use by:

- Rinsing the rod with deionized water
- Wiping the rid with a methanol soaked paper towel
- Rinsing the rod with deionized water
- Wiping the rod with a clean dry paper towel

The field team will transport deionized water and methanol in small portable squirt bottles.

The organic vapor detector will be calibrated according to the manufacturer's instructions and the calibration records will be placed in the project files. Any organic vapor meter can be used for the survey; however, only one type of meter will be used for the investigation area.

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DAILY SOIL VAPOR SURVEY DATA LOG

INSTRUMENT NUMBER ______ DATE __/__/__

OPERATOR ______________________________

CALIBRATION LOT No. ____________________

CALIBRATION ________ SPAN ________

SAMPLE LOCATION

POINT	COORDINATES NORTH	EAST	TIME	READINGS PEAK	STABLE
			:		
			:		
			:		
			:		
			:		
			:		
			:		
			:		
			:		
			:		
			:		
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			:		
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FIGURE 1